

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-045550

(43)Date of publication of application : 14.02.1995

(51)Int.Cl.

H01L 21/28

G03F 7/40

H01L 21/027

H01L 21/3065

(21)Application number : 05-108700

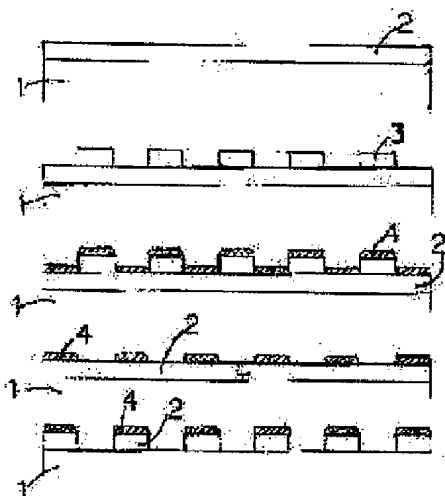
(71)Applicant : YAMANOUCI KAZUHIKO

(22)Date of filing : 29.03.1993

(72)Inventor : YAMANOUCI KAZUHIKO

(54) FINE ELECTRODE MANUFACTURING METHOD AND ELECTRONIC DEVICE

(57)Abstract:



PURPOSE: To obtain the title fine structured electrode film by a method wherein a resist film is used as the primary protective metallic film and then the secondary protective metallic film is left intact using an etchant capable of etching the primary protective metallic film but unable to etch the second protective metallic film.

CONSTITUTION: A metallic film 2 is bonded onto a semiconductor substrate 1 to form patterns 3 comprising resist 3 thereon and then another metallic film 4 is bonded onto the patterns 3. Next, the resist film 3 is removed to exposed the metallic films 2 and 4. Next, the metallic film 2 is removed using an etchant or an etching gas capable of etching the

metallic film 2 but unable to etch the metallic film 4 or hardly etching the same 4. Through these procedures, the title fine structured electrode can be made of extremely thin resist film.

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CLAIMS

[Claim(s)]

[Claim 1] The 1st process which makes a metal membrane adhere on a substrate with an insulating substrate, a piezoelectric substrate, or a piezoelectric thin film, the substrate of half-insulation, or the semi-conductor substrate 1, The 2nd process which produces the various patterns which apply a resist etc. on it and are made into the purpose by the optical exposing method etc., The 3rd process to which a metal membrane is made to adhere from moreover, and the 4th process at which the resist film is removed and the metal membrane of the 1st process and the metal membrane of the 3rd process are exposed, According to the 5th process which removes the 1st metal membrane using the etching reagent or etching gas which is hard to be etched or the metal membrane of the 3rd process is not etched, although the metal membrane of the 1st process is etched The electronic instrument obtained using the producing method for obtaining the target electrode, or this producing method.

[Claim 2] The 6th process to which the chemical change even of the thickness with the 1st exposed metal membrane is carried out by oxidation etc. as the 3rd process in the 1st term of the range of an application for patent instead of making a metal membrane adhere, It is the electronic instrument obtained using the producing method for obtaining the target electrode according to the 7th process which removes the 1st metal membrane using the etching reagent or etching gas which is hard to be etched or the film of the 6th process is not etched, or this producing method although the metal membrane of the 1st process is etched.

[Claim 3] In the 1st term of the range of an application for patent, as the 3rd process instead of making a metal membrane adhere Even thickness with the 1st exposed metal membrane by anodic oxidation According to the 9th process which removes the 1st metal membrane using the etching reagent or etching gas which is hard to be etched or the film of the 8th process is not etched, although the metal membrane of the 8th process which carries out a chemical change to a metal oxide film, and the 1st process is etched The electronic instrument obtained using the producing method for obtaining the target electrode, or this producing method.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the electronic instrument using the approach of producing the electrode of the fine structure, and its approach.

[0002]

[Description of the Prior Art] Conventionally, as one approach of producing the electrode of the fine structure, after producing the target pattern by applying a resist on it and carrying out exposure development of the resist using a photo mask, after making a metal membrane adhere to a substrate front face, the target metal electrode has been obtained by etching a metal membrane by using a resist as a protective coat. However, by this approach, the case where a surroundings lump and the target electrode structure are not acquired under the resist film an etching reagent or whose etching gas is a protective coat when the resist film cannot bear an etching reagent or etching gas, or when the degree of adhesion of a metal membrane and a resist is bad arises.

[0003]

[Problem(s) to be Solved by the Invention] It solves, it is made that the conventional defect should be removed and this invention relates to the approach of obtaining the electrode layer of the hyperfine structure, by [which were mentioned above] obtaining a protective coat strong against the good etching reagent or the etching gas of a degree of adhesion with a metal membrane.

[0004]

[Means for Solving the Problem] Although the first metal membrane is etched, the protective coat in the case of etching a metal membrane 2 to the approach of obtaining the electrode of the fine structure by etching a metal membrane by using the conventional resist film as a protective coat in order to solve an above-mentioned technical problem, using the resist film as primary protective coat By considering as the metal membrane which is hard to be etched or it is not etched in this etching reagent or etching gas, the film which changed chemically, or film, such as an oxide film on anode of the first metal membrane It is the approach of obtaining the electrode of the fine structure by etching, and while extending the degree of freedom of selection of a resist, it is the approach which solved the problem of the adhesion of a resist and a substrate.

[0005]

[Example] The 1st process to which 1 of an example makes a metal membrane 2 adhere on a substrate with an insulating substrate, a piezoelectric substrate, or a piezoelectric thin film, the substrate of half-insulation, or the semi-conductor substrate 1 as shown in Fig. 1, The 2nd process which produces the various patterns which apply a resist etc. on it and consist of the target resist 3 by the optical exposing method etc., The 3rd process to which a metal membrane 4 is made to adhere from moreover, and the 4th process at which the resist film is removed and the metal membrane 2 of the 1st process and the metal membrane 4 of the 3rd process are exposed, Although the metal membrane 2 of the 1st process is etched, the method of obtaining the target electrode according to the 5th process which removes the 1st metal membrane 2 using the etching reagent or etching gas which is hard to be etched or the metal

membrane of the 3rd process is not etched is 1 of an example. 2 of an example is set in the 1st term of the range of an application for patent, as shown in Fig. 2. As the 3rd process The 6th process which is made to carry out the chemical change even of the thickness which has the 1st exposed metal membrane instead of making a metal membrane adhere by oxidation etc., and obtains the new film 5, Although the metal membrane 2 of the 1st process is etched, the method of obtaining the target electrode according to the 7th process which removes the 1st metal membrane 2 using the etching reagent or etching gas which is hard to be etched or the film of the 6th process is not etched is 2 of an example. 3 of an example is set in the 1st term of the range of an application for patent. As the 3rd process The 8th process which carries out the chemical change even of the thickness which has the 1st exposed metal membrane instead of making a metal membrane adhere to the metal oxide film 6 by anodic oxidation, Although the metal membrane 2 of the 1st process is etched, the method of obtaining the target electrode according to the 9th process which removes the 1st metal membrane 2 using the etching reagent or etching gas which is hard to be etched or the film of the 8th process is not etched is the 3rd example. The pattern after creating the pattern which applied the resist as an experiment of this invention, using the 0.3-micrometer aluminum film as a metal membrane 1, obtaining 2Oaluminum3 film 4 by anodic oxidation and etching the aluminum film by using 2Oaluminum3 film as a protective coat is shown in drawing 4. In 2 micrometers, the aluminum electrode width of face in this case is **, and an electrode period is 4 micrometers. All in the case of removing with the case where the protective coat used for etching after resist removal of this invention is left as it is are contained in this patent. Moreover, the metal membrane 4 of the 3rd process does not necessarily need to be a metal membrane, the thin film besides a resist or organic ***** is sufficient, and these are also contained in this patent. Moreover, wet etching, dry etching, or the approach the outside of it is sufficient as the approach of etching the metal membrane 2 of the 1st process by this invention, and it is included in this patent.

[0007]

[Effect of the Invention] While the need that the resist film is large resist film of etching-proof nature is lost by using the approach of this invention, the electrode of the fine structure is obtained by the very thin resist film. Moreover, since the adhesion of a protective coat and a metal membrane is good, the electrode of still narrower width of face is obtained.

[0008]

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] This invention relates to the electronic instrument using the approach of producing the electrode of the fine structure, and its approach.

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PRIOR ART

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] It solves, it is made that the conventional defect should be removed and this invention relates to the approach of obtaining the electrode layer of the hyperfine structure, by [which were mentioned above] obtaining a protective coat strong against the good etching reagent or the etching gas of a degree of adhesion with a metal membrane.

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MEANS

[Means for Solving the Problem] Although the first metal membrane is etched, the protective coat in the case of etching a metal membrane 2 to the approach of obtaining the electrode of the fine structure by etching a metal membrane by using the conventional resist film as a protective coat in order to solve an above-mentioned technical problem, using the resist film as primary protective coat By considering as the metal membrane which is hard to be etched or it is not etched in this etching reagent or etching gas, the film which changed chemically, or film, such as an oxide film on anode of the first metal membrane It is the approach of obtaining the electrode of the fine structure by etching, and while extending the degree of freedom of selection of a resist, it is the approach which solved the problem of the adhesion of a resist and a substrate.

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EXAMPLE

[Example] The 1st process to which 1 of an example makes a metal membrane 2 adhere on a substrate with an insulating substrate, a piezoelectric substrate, or a piezoelectric thin film, the substrate of half-insulation, or the semi-conductor substrate 1 as shown in Fig. 1, The 2nd process which produces the various patterns which apply a resist etc. on it and consist of the target resist 3 by the optical exposing method etc., The 3rd process to which a metal membrane 4 is made to adhere from moreover, and the 4th process at which the resist film is removed and the metal membrane 2 of the 1st process and the metal membrane 4 of the 3rd process are exposed, Although the metal membrane 2 of the 1st process is etched, the method of obtaining the target electrode according to the 5th process which removes the 1st metal membrane 2 using the etching reagent or etching gas which is hard to be etched or the metal membrane of the 3rd process is not etched is 1 of an example. 2 of an example is set in the 1st term of the range of an application for patent, as shown in Fig. 2. As the 3rd process The 6th process which is made to carry out the chemical change even of the thickness which has the 1st exposed metal membrane instead of making a metal membrane adhere by oxidation etc., and obtains the new film 5, Although the metal membrane 2 of the 1st process is etched, the method of obtaining the target electrode according to the 7th process which removes the 1st metal membrane 2 using the etching reagent or etching gas which is hard to be etched or the film of the 6th process is not etched is 2 of an example. 3 of an example is set in the 1st term of the range of an application for patent. As the 3rd process The 8th process which carries out the chemical change even of the thickness which has the 1st exposed metal membrane instead of making a metal membrane adhere to the metal oxide film 6 by anodic oxidation, Although the metal membrane 2 of the 1st process is etched, the method of obtaining the target electrode according to the 9th process which removes the 1st metal membrane 2 using the etching reagent or etching gas which is hard to be etched or the film of the 8th process is not etched is the 3rd example. The pattern after creating the pattern which applied the resist as an experiment of this invention, using the 0.3-micrometer aluminum film as a metal membrane 1, obtaining 2Oaluminum3 film 4 by anodic oxidation and etching the aluminum film by using 2Oaluminum3 film as a protective coat is shown in drawing 4. In 2 micrometers, the aluminum electrode width of face in this case is **, and an electrode period is 4 micrometers. All in the case of removing with the case where the protective coat used for etching after resist removal of this invention is left as it is are contained in this patent. Moreover, the metal membrane 4 of the 3rd process does not necessarily need to be a metal membrane, the thin film besides a resist or organic ***** is sufficient, and these are also contained in this patent. Moreover, wet etching, dry etching, or the approach the outside of it is sufficient as the approach of etching the metal membrane 2 of the 1st process by this invention, and it is included in this patent.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the example of the process which creates the electrode of the fine structure of this invention.

[Drawing 2] It is the sectional view showing the process which uses the chemical change film as a protective coat instead of the 3rd process of drawing 1 among the processes which create the electrode of the fine structure of this invention.

[Drawing 3] It is the sectional view showing the process which uses an oxide film on anode as a protective coat instead of the 3rd process of drawing 1 among the processes which create the electrode of the fine structure of this invention.

[Drawing 4] It is the microphotography of the aluminum electrode created using the approach of this invention.

[Description of Notations]

1 { -- A metal membrane, 5 / -- The chemical change film, 6 / -- Oxide film on anode, } -- A substrate, 2 -- A metal membrane, 3 -- A resist, 4

[Translation done.]

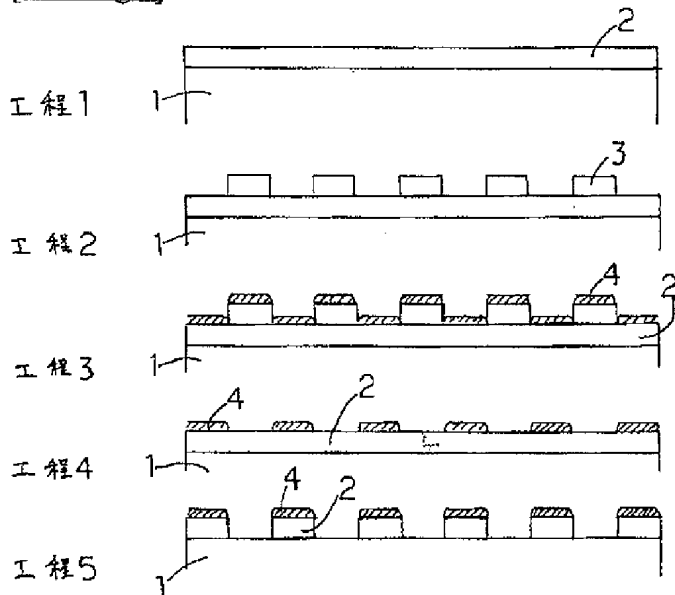
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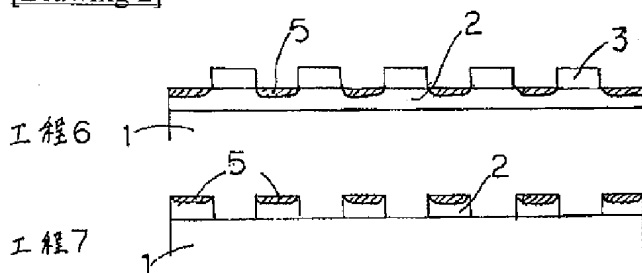
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DRAWINGS

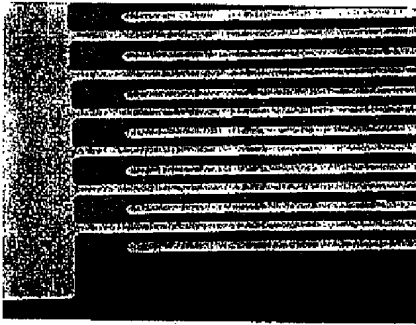
[Drawing 1]



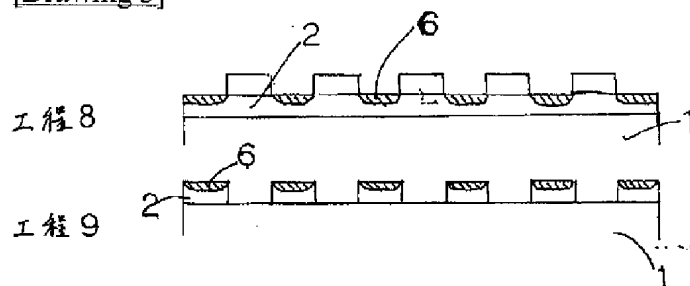
[Drawing 2]



[Drawing 4]



[Drawing 3]



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WRITTEN AMENDMENT

----- [a procedure revision]

[Filing Date] March 11, Heisei 6

[Procedure amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] drawing 4

[Method of Amendment] Modification

[Proposed Amendment]

[Drawing 4] It is drawing of the aluminum electrode created using the approach of this invention.

[Procedure amendment 2]

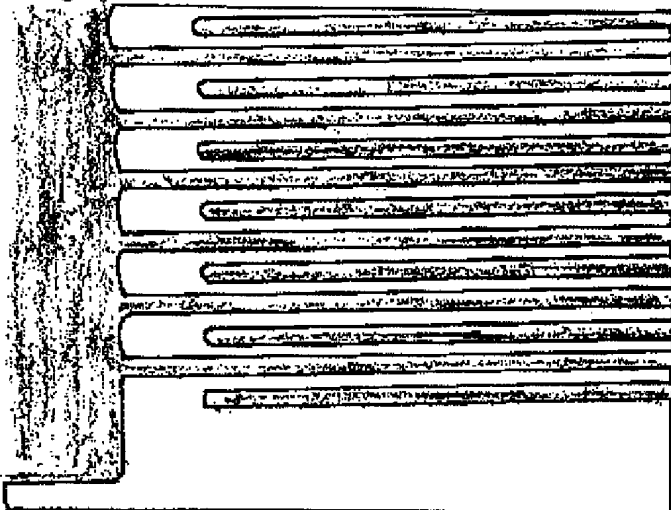
[Document to be Amended] DRAWINGS

[Item(s) to be Amended] drawing 4

[Method of Amendment] Modification

[Proposed Amendment]

[Drawing 4]



[Translation done.]

対応なし、英抄

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平7-45550

(43) 公開日 平成7年(1995)2月14日

(51) Int.Cl. ⁶	識別記号	序内整理番号	F I	技術表示箇所
H 0 1 L 21/28		F 7376-4M		
G 0 3 F 7/40	5 2 1	7124-2H		
H 0 1 L 21/027		7352-4M	H 0 1 L 21/ 30	5 7 2
			21/ 302	J
審査請求 未請求 請求項の数 3 書面 (全 4 頁) 最終頁に続く				

(21) 出願番号 特願平5-108700

(22) 出願日 平成5年(1993)3月29日

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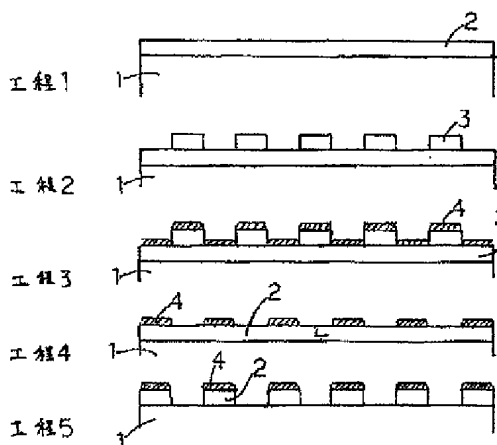
仙台市太白区松が丘37-13

(54) 【発明の名称】 微細電極作製法と電子装置

(57) 【要約】

レジスト膜を用いてエッチングに強い保護膜を作成し、この保護膜を用いて微細構造の電極を作製することを目的としている。

【構成】 基板表面に金属膜を付着させ、レジスト膜を用いてパターンを作成した後、露出した金属膜の表面に新たな保護膜を作成した後、エッチングにより目的の微細構造の電極を得る。



【特許請求の範囲】

【請求項1】絶縁性基板或いは圧電性基板或いは圧電性薄膜をもつ基板或いは半絶縁性の基板或いは半導体基板1の上に、金属膜を付着させる第1の工程と、その上にレジストなどを塗布して光露光法などにより目的とする種々のパターンを作製する第2の工程と、その上から金属膜を付着させる第3の工程と、レジスト膜を除去して第1の工程の金属膜と第3の工程の金属膜を露出させる第4の工程と、第1の工程の金属膜はエッチングされるが第3の工程の金属膜はエッチングされない或いはエッチングされにくいエッチング液或いはエッチングガスを用いて第1の金属膜を除去する第5の工程により目的の電極を得る作製法或いはこの作製法を用いて得られる電子装置。

【請求項2】特許請求の範囲第1項において、第3の工程として、金属膜を付着させる代わりに、露出している第1の金属膜のある厚さまでを酸化などにより化学変化させる第6の工程と、第1の工程の金属膜はエッチングされるが第6の工程の膜はエッチングされない或いはエッチングされにくいエッチング液或いはエッチングガスを用いて第1の金属膜を除去する第7の工程により目的の電極を得る作製法或いはこの作製法を用いて得られる電子装置。

【請求項3】特許請求の範囲第1項において、第3の工程として、金属膜を付着させる代わりに、露出している第1の金属膜のある厚さまでを陽極酸化により金属酸化膜に化学変化させる第8の工程と第1の工程の金属膜はエッチングされるが第8の工程の膜はエッチングされない或いはエッチングされにくいエッチング液或いはエッチングガスを用いて第1の金属膜を除去する第9の工程により目的の電極を得る作製法或いはこの作製法を用いて得られる電子装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は微細構造の電極を作製する方法とその方法を用いた電子装置に関する。

【0002】

【従来技術】従来は、微細構造の電極を作製する方法として、基板表面に金属膜を付着させた後、その上にレジストを塗布し、フォトリソを用いてレジストを露光現像することにより目的のパターンを作製した後、レジストを保護膜として、金属膜をエッチングすることにより目的の金属電極を得ている。しかし、この方法では、レジスト膜がエッチング液或いはエッチングガスに耐えられない場合、或いは金属膜とレジストの密着度が悪い場合、エッチング液或いはエッチングガスが保護膜であるレジスト膜の下に廻り込み、目的の電極構造が得られない場合が生ずる。

【0003】

【発明が解決しようとする課題】本発明は上述したごと

き従来の欠陥を除去すべくなされたものであって、金属膜との密着度の良い、エッチング液或いはエッチングガスに強い保護膜を得ることにより、超微細構造の電極膜を得る方法に関するものである。

【0004】

【課題を解決するための手段】上述の課題を解決するために、従来のレジスト膜を保護膜として、金属膜をエッチングすることにより微細構造の電極を得る方法に対して、レジスト膜を1次の保護膜として用い、金属膜2をエッチングする場合の保護膜は、最初の金属膜はエッチングされるが、このエッチング液或いはエッチングガスではエッチングされない或いはエッチングされにくい金属膜或いは化学変化した膜或いは最初の金属膜の陽極酸化膜などの膜とすることにより、エッチングにより微細構造の電極を得る方法であり、レジストの選択の自由度を広げると共に、レジストと基板との密着性の問題を解決した方法である。

【0005】

【実施例】実施例の1は、第1図のように、絶縁性基板或は圧電性基板或いは圧電性薄膜をもつ基板或いは半絶縁性の基板或いは半導体基板1の上に、金属膜2を付着させる第1の工程と、その上にレジストなどを塗布して光露光法などにより目的とするレジスト3からなる種々のパターンを作製する第2の工程と、その上から金属膜4を付着させる第3の工程と、レジスト膜を除去して第1の工程の金属膜2と第3の工程の金属膜4を露出させる第4の工程と、第1の工程の金属膜2はエッチングされるが第3の工程の金属膜はエッチングされない或いはエッチングされにくいエッチング液或いはエッチングガスを用いて第1の金属膜2を除去する第5の工程により目的の電極を得る方法が実施例の1である。実施例の2は、第2図のように、特許請求の範囲第1項において、第3の工程として、金属膜を付着させる代わりに、露出している第1の金属膜のある厚さまでを酸化などにより化学変化させて新たな膜5を得る第6の工程と、第1の工程の金属膜2はエッチングされるが第6の工程の膜はエッチングされない或いはエッチングされにくいエッチング液或いはエッチングガスを用いて第1の金属膜2を除去する第7の工程により目的の電極を得る方法が実施例の2である。実施例の3は、特許請求の範囲第1項において、第3の工程として、金属膜を付着させる代わりに、露出している第1の金属膜のある厚さまでを陽極酸化により金属酸化膜6に化学変化させる第8の工程と、第1の工程の金属膜2はエッチングされるが第8の工程の膜はエッチングされない或いはエッチングされにくいエッチング液或いはエッチングガスを用いて第1の金属膜2を除去する第9の工程により目的の電極を得る方法が第3の実施例である。本発明の実験として、金属膜1として0.3μmのアルミニウム膜を用い、レジストを塗布したパターンを作成した後、陽極酸化によりA1

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。O、膜4を得た後A1: O、膜を保護膜としてアルミニウム膜をエッチングした後のパターンを図4に示す。この場合のアルミニウム電極幅は2μmで、電極周期は4μmである。本発明のレジスト除去後のエッチングに用いた保護膜は、そのまま残す場合と除去する場合のいずれも本特許に含まれる。また、第3の工程の金属膜4は、必ずしも金属膜である必要はなく、レジスト或いは有機薄膜その他の薄膜でもよく、これらも本特許に含まれる。また、本発明で第1の工程の金属膜2をエッチングする方法は、ウェットエッチング或いはドライエッチング或いはその他の方法でもよく、本特許に含まれる。

【0007】

【発明の効果】本発明の方法を用いることにより、レジスト膜は耐エッチング性の大きいレジスト膜である必要が無くとも共に、非常に薄いレジスト膜で微細構造の電極が得られる。また、保護膜と金属膜との密着性が良*

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*いので、更に狭い幅の電極が得られる。

【0008】

【図面の簡単な説明】

【図1】本発明の微細構造の電極を作成する工程の実施例を示す断面図である。

【図2】本発明の微細構造の電極を作成する工程の内、図1の第3の工程の代わりに、化学変化膜を保護膜として用いる工程を示す断面図である。

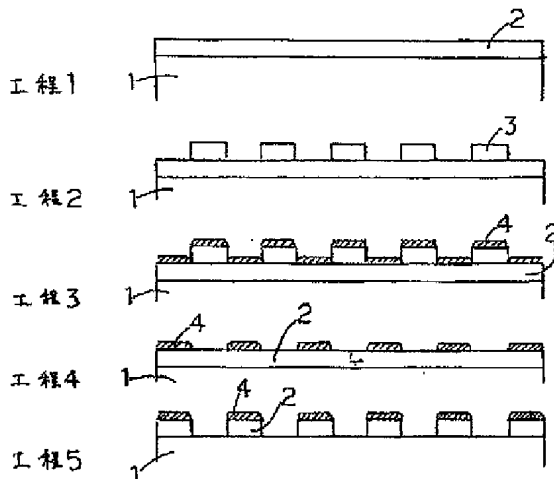
【図3】本発明の微細構造の電極を作成する工程の内、図1の第3の工程の代わりに、陽極酸化膜を保護膜として用いる工程を示す断面図である。

【図4】本発明の方法を用いて作成したアルミニウム電極の顕微鏡写真である。

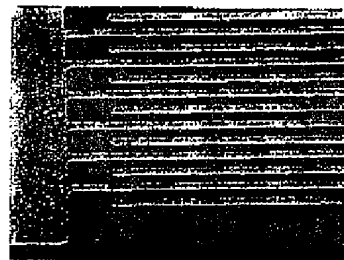
【符号の説明】

1…基板、2…金属膜、3…レジスト、4…金属膜、5…化学変化膜、6…陽極酸化膜、

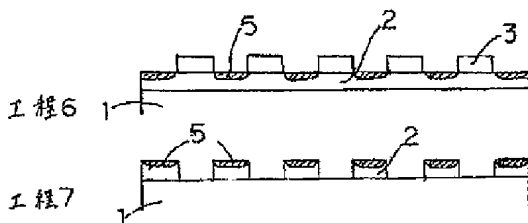
【図1】



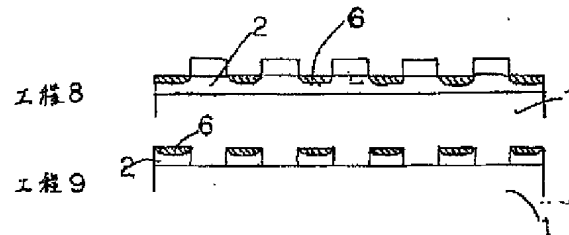
【図4】



【図2】



【図3】



【手続補正書】

【提出日】平成6年3月11日

【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】図4

【補正方法】変更

【補正内容】

【図4】本発明の方法を用いて作成したアルミニウム電極の図である。

【手続補正2】

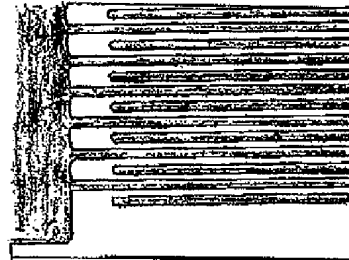
【補正対象書類名】図面

【補正対象項目名】図4

【補正方法】変更

*【補正内容】

【図4】



*

フロントページの続き

(51)Int.Cl.⁶

H01L 21/3065

識別記号

庁内整理番号

F I

技術表示箇所